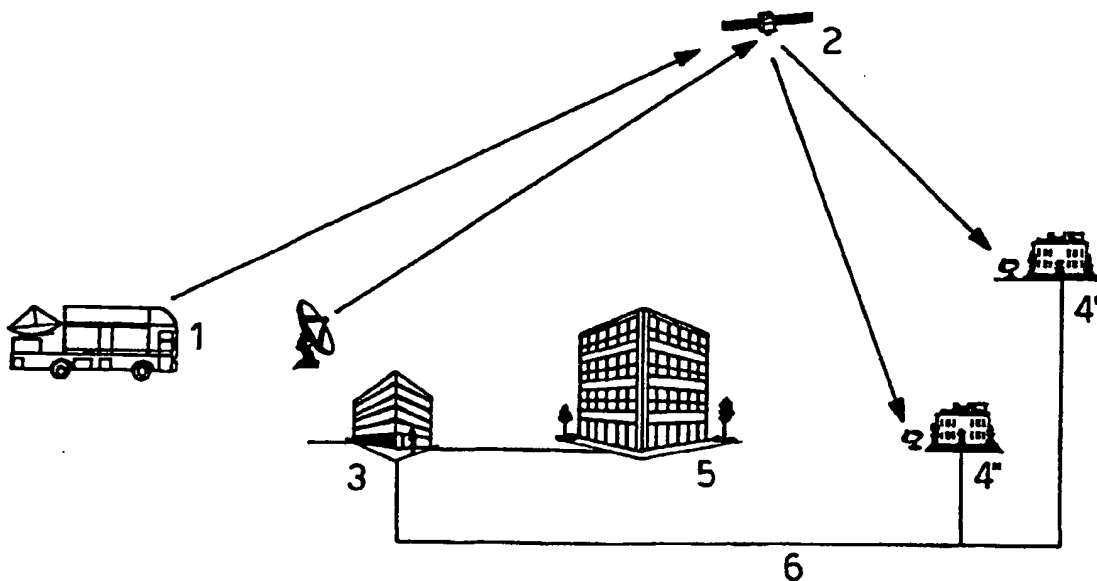




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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| (21) International Application Number: PCT/IT96/00155 (22) International Filing Date: 29 July 1996 (29.07.96) (30) Priority Data: RM95A000553 4 August 1995 (04.08.95) IT (71) Applicant (for all designated States except US): SIP - SOCI- ETA' ITALIANA PER L'ESERCIZIO DELLE TELECO- MINICAZIONI P.A. doing business as TELECOM ITALIA S.P.A. [IT/IT]; Via Flaminia, 189, I-00189 Roma (IT). (72) Inventor; and (75) Inventor/Applicant (for US only): GULLA', Vincenzo [IT/IT]; Via Tuberosa, 26, I-00012 Guidonia (IT). (74) Agents: DOMENIGHETTI FIAMMENGHI, Delfina et al.; Fiammenghi Fiammenghi, Via Quattro Fontane, 31, I-00184 Roma (IT). | | (81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report. | |

(54) Title: HIGH DEFINITION TV MOTION PICTURE DISTRIBUTION NETWORK



(57) Abstract

High definition TV motion picture distribution network via satellite comprising a service center (5) for the management and the commercial/administrative planning, a network control center (3) which controls the network both as regards the transmission via satellite (2) and the monitoring of the receiver terminals (4', 4'', ...4ⁿ) through the terrestrial network (6), said receiver terminals being provided with a data recording device (22), a high resolution decoder (23), and a control unit (24) which stores and processes again information related to the operation of the terminal (4). Transportable units (1) directly linked to the satellite (2) allow to transmit live pictures through the network.

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- 1 -

DescriptionHigh definition TV motion picture distribution networkTechnical field

This invention relates generally to distribution techniques of HDTV images (High definition TV) via satellites, and more particularly it relates to a
5 network allowing to transmit or distribute a motion picture directly to cinema halls, to record and to reproduce it on a large screen, and moreover to distribute live pictures to cinema halls with a remote monitoring suited to a centralised management of cinema
10 halls.

Background Art

The presently used film distribution system provides for the production of a limited number of copies which are
15 reserved for said distribution which initially takes place only in cinema halls of the most important cities and only later in cinema halls of towns.

The copies which have been produced have a limited life and the image quality deteriorates in a direct functional
20 relationship according to the number of film-shows performed with this copy, at the expense - in some cases - of the quality of successive film-shows.

Moreover, the conventional motion picture distribution system has the serious drawback that it is easily
25 exposed to an illegal reproduction (piracy).

In order to increase the interest of the public for the cinema and to reduce the management cost of cinema halls, some time ago the concept of a multiroom has been developed, according to which the cinema halls usually
5 containing some hundreds of persons have been divided up into rooms having a capacity of ten spectators or some multiple thereof, so that it is possible to show various movies at the same time.

According to this concept the art of entertainment has
10 developed multiservice centers: cinema halls are combined with commercial centers so as to offer a variety of services which becomes more and more diversified.

The need to centralise simultaneous management of a
15 plurality of cinema halls is becoming urgent, and it satisfies the prerequisite of allowing a better use of human resources and a more rapid coordination of the cinema halls which can be used for cultural programmes in video-conferences, advertising for a new product,
20 tele-education, and so on.

In order to satisfy the above necessities, the technology related to digital signal coding and transmitting can nowadays make available on the market, motion pictures production and processing
25 systems, having a high resolution, and if said systems are combined with telecommunication systems via satellites, they provide a valid means for the implementation of high definition TV (HDTV) image

distribution services with high quality and for professional application. In particular, the application concerning telecinema transmission will be considered, according to which the celluloid film and the projection machines are replaced by modern apparatus obtained from computer technologies, suited to store in their memory a movie which may last for hours and which is adequately coded, or to reproduce images on large screens.

According to the state of the art, experiments have been carried out on the image distribution technique to cinema halls, both in Europe and in the USA, using satellites or cables.

In particular, it is known that in the USA a HDTV motion picture distribution network has been realized, wherein the digital transmission is performed by means of optical fibres, in ten experimental locations. On the other hand, live picture distribution via satellites employing dedicated analogue techniques is being tested in France for cinema halls of towns.

Both these image distribution techniques cannot solve in an exhaustive manner all the above mentioned problems of the conventional method of film distribution, by providing an adequate motion picture distribution network via satellite.

Disclosure of Invention

An object of the present invention is to provide a HDTV motion picture distribution network, employing a single

digitized copy of the movie to be transmitted, so as to reduce noticeably the cost due to the number of copies, and to increase the life of the copy, which turns to the advantage of the quality of the projected images and prevents any kind of illegal reproduction.

A further object of the invention is to provide a HDTV motion picture distribution network, allowing to show live pictures on motion picture screens, using this service network.

Another object of the present invention is to provide a HDTV motion picture distribution network which automates the apparatus for receiving and reproducing the motion pictures, through the transmission of remote controls for remote monitoring of the correct operation of the terminals.

A last object of the invention is to provide a HDTV motion picture distribution network which uses standard components so that said components are easily found to thereby facilitate their maintenance and have operating frequencies in conformity with the standards of international rules, so that their applications will have a large diffusion and a low cost.

The above and other purposes which will be apparent from the description are attained by a high definition TV motion picture distribution network via satellite, comprising:

I) a service center for the management and commercial / administrative planning of the film distribution in the

various cinema-halls;

II) a network control center which performs the following operations:

- a) transmitting the movies filed by the service center,
5 to the addressees of users, according to the planning of the service center;
 - b) enabling the receiver terminals of the users by means of the network software, which checks the situation of the terminal; wherein the control center puts into
10 effect all the access and diagnostic functions through the terrestrial lines;
 - c) check of the quality of the transmission via satellites by monitoring both the transmission terminal and the receiver terminals;
 - 15 d) promoting the maintenance of the receiver terminals in the event of malfunctions;
 - e) determining the modalities how the data are to be transmitted again to those receiver terminals which showed to have anomalies in recording and in the
20 quality of the received signal;
 - f) coordination of the transportable units for the transmission of the live picture shooting, enabling the user terminals to receive the signal;
- III) a plurality of receiver terminals, each of them
25 comprising:
- a receiver via satellite, a demodulator, a digital recording apparatus, a decoder and an apparatus for the projection of the movie on a large screen according to

high definition standards, wherein these constituent blocks or components, are interfaced with a control unit performing the telemetering and detection functions on the blocks comprised in the receiver terminal; wherein
5 the control unit stores and processes again the information related to the operation of the terminal (operative state, projection times, number of projections or projection quality, etc.), said control unit being directly linked by means of dedicated communication protocols and through
10 terrestrial telephone lines to the network control center;
IV) transportable units for the live pictures shooting and transmission, which are directly linked to the satellite during transmission and monitored by the control center of the network.

15

Brief description of Drawings

In order to better illustrate the invention and without limiting in this way its generality and the field of its possible applications, in what follows a preferred
20 embodiment thereof will be described with reference to the annexed drawings, in which:

Fig.1 shows a general view of the whole motion picture distribution network via satellite;

25 Fig.2 shows the constituent blocks or componements of the control center 3 of Fig.1; and

Fig. 3 shows the constituent blocks or components of a

- 7 -

receiver terminal 4 of Fig.1.

Best Mode of Carrying out the Invention

With reference to Fig.1 the distribution network has a
5 star-like configuration extending from and around the
transmission and control center 3 of the network, which
is directly connected to the service center 5 and is
hierarchically dependent from the latter as concerns
the exercise of this service. The archives (files) of
10 the films ~~are kept inside the control center 3 of the~~
~~network, in order to maintain the control over the data~~
source and in order to avoid other unforeseen
connections. The shootings for live pictures are
performed by transportable units 1 which have a direct
15 access to the satellite 2 and the signal is received
only by terminals enabled by the control center 3.
Besides the connection via satellite for the
transmission of HDTV images there is provided a return
connection with the control center of the network for
20 the monitoring of the terminals 4',4".
In order to reduce the cost of this network and because
of the low prerequisites with respect to data traffic,
monitoring of the network is done via cable lines 6.
The operations of transmission to the satellite and of
25 control of the receiving terminals are performed by a
control center specialized in the management of the
network and which is responsible for the correct
operation of the apparatus and of the continuity and

quality of this service. The control center 3 of the network is shown according to its minimum configuration in Fig.2. The transmission to the end users of the films stored in the archives and the transformation of the film in a digital signal, is carried out sequentially by the functional blocks comprising HDTV apparatus 7, a digital reproducer 8, an encoder 9 and a modulator 10 which transmits the 20-30 Ghz signal, along the line TX.

According to a preferred embodiment, the transmission via satellite is carried out by a stationary terminal with an irradiation power of 70 dbW, to allow signal reception via satellite by means of antennas of 1,2 m. The signal transmission rate may be 34 Mbit/s or 45 Mbit/s according to the desired image quality. MPEG-1 HDTV encoding systems may be applicable as well. The connection parameters ensure a service availability not less than 99%, by using a QPSK modulation (quadrature phase shift keying) with 1/2 FEC or 3/4 FEC. As has been said above, besides enabling the receiver units 4',4", the control center checks also the quality of the transmission via satellite. Monitoring of the receiving terminals may be obtained alternatively at a centralised level (by providing in the control center on the line RX a demodulator 11, a decoder 12 and a monitor HDTV 13 for the image reproduction, and a monitor 15 for a general control of the network, which is interfaced with the telephone

lines 6) or at a local level, according to the network dimensions and the number of terminals to be managed.

A receiver terminal 4, as shown in Fig.3, comprises a receiver via satellite 20, a demodulator 21, an apparatus for digital recording 22, a decoder 23, a control unit 24 and an apparatus for HDTV motion picture projection 25 on a large screen.

According to a preferred embodiment, at the level of the receiver 20, the terminal is suited to receive a digital signal with a transmission rate of 34-45 Mbit/s or MPEG-2 HDTV bit rates transmitted from the satellite system ITALSAT, operating on the band Ka. The technical features of the receiver 20 ensure a noise pattern which is better than 24 dB using antennas of 1,2m. The low noise block (LNB) of the receiver converts the signal of the Ka band (20/30Ghz) to the band L(1-1.6Ghz). The noise temperature of the LNB is less than 180°K. The output signal from the LNB is demodulated through a QPSK digital demodulator 21 with the standard IDRIESS 308 and suited to manage a data rate of 34-45 Mbit/s. For MPEG-2 HDTV applications, an appropriate MPEG-2 demodulator will be adopted, when made available to the market. The output of the demodulator 21 is a digital signal having an electric standard G703.

The system is applicable also to other frequency bands, for instance Ku (12-14Ghz).

In this case the antenna and the related parameters

- 10 -

(LNB,G/T antenna diameter) will assume different values to be determined according to circumstances.

A general terminal 4 designed to receive and reproduce the HDTV image for the film distribution network is based on the following operational specifications with respect to protocols and network access:

- protocols for signal transmission in a wide-band;
- protocols for network communication and monitoring.

With respect to the first type, in the network configuration, the wideband signal containing the information of the distributed movies is transmitted via satellite; the transmission protocol has the task of communicating with receiver terminal 4 for the control of the quality of the transmitted signal, through a check of the reception parameters.

~~The signal is therefore decomposed into packets having a predetermined length. Every packet is numbered so as to~~
be easily identified and substituted in case it does not correspond to quality standards. The packets have a structure including a heading which is followed by information data. The heading contains the sequence data of the packet, so as to permit to reconstruct the original flow of the movie. The packet length and the numbering algorithm are experimentally determined. The necessity of remote monitoring of the terminals is fulfilled using network communication and monitoring protocols which enable the communication, providing for the sending of messages and control signals at

- 11 -

predefined addresses. The protocol allows the control center of the network to perform some basic operations like:

- polling or interrogation of the selected terminals;
- 5 - narrowcasting, or data distribution to a limited and selected number of terminals;

broadcasting, or data distribution to all terminals.

The terminals which receive the control signals and data signals, send a message to confirm their reception (acknowledge). The communication protocols provide for
10 the reply function. The format of the reply protocol includes a heading containing the receiver addresses of the message, the sender and the transmitted information. The length and the format of the messages are
15 experimentally defined.

The communication with the terminals requires an access technique allowing all terminals 4 to successfully send messages containing the required data, or simply the return of the "acknowledge" messages to the network
20 control center, wherein the preferred access technique is the "slotted aloha".

The system characteristics are such as to satisfy the specific technical necessities depending on the dataflow and data nature, and on the demand to preserve
25 them in a protected environment.

The signal at the output of the demodulator 21 may be directly sent to the decoder 23 or it may be stored in a device 22 developed specifically for this purpose,

suited to receive a digital signal at a rate of 34-45 Mbit/s. The recording device 22 transforms the electric signals with standard characteristics G703 into a digital flow which is suited to be buffered. This interface
5 comprises electronic components developed according to the I/O gates specifications. The received data are buffered in the memory banks managed by a CPU.

The output signal from the physical medium has the same properties as that originally received and may be
10 reproduced when desired.

The memory of the recording device 22 comprises a physical non-removable medium, as for example a hard-disk. The memory capacity in the 34-45 Mbit/s case, will be equal or greater than 35 Gbyte, so as to be able to
15 store the data corresponding to a movie lasting more than two hours.

The recording device 22 has some piracy preventing functions, so as to protect the content of the memories from external intrusion or attempts of non-authorized
20 reproduction.

For this purpose, during projection of the movie stored in the hard disk, a terminal recognition number is randomly introduced. This number is not visible during normal reproduction, but when the film is shown in slow-
25 motion. This allows to determine in an univocal way the relation between a receiver terminal and the illegal copy of the movie reproduced from it by means of a piracy action.

This is accomplished by the software residing in the recording apparatus, which insets in a random way and in a different way for each projection, a plurality of coded pixels with a frequency which is lower than
5 eighteen images/ second.

The recording apparatus is further protected from external non-authorized tampering, by means of a self-destruction technique of the content of the memories. This allows to obtain a protection against possible
10 attempts to remove the hard disk.

The memory erasure function is activated by electro-mechanical devices (microswitches and anti-intrusion sensors).

The software of the recording unit 22 comprised in the terminal, is suited to reconstruct the received movies (ordering the received communication packets), according
15 to the sequential predetermined numbering.

If a packet does not correspond to quality standards, the terminal software eliminates this packet and
20 provides for its substitution. The communication between the terminal and the control center is realized by means of the two transmission means provided for. Based on recommendation 601 of CCIR the HDTV standards may be:

- 1250 rows, 50 Raster/sec
- 25 - 1125 rows, 60 Raster/sec

Europe has adopted the standard 1250/50 whereas Japan and USA have chosen the standard 1125/60. The coding system of the motion picture distribution terminal is

compatible with both standards.

The chosen data flow of 34/45 Mbit/s is obtained by compressing the data of the original image, by means of a DCT type algorithm of compression with Motion

5 Compensation and Variable Length Coding functions.

To the video digital signal there are associated three or four audio, stereo or digital channels (equivalent to 6 or 8 monochannels), of CD quality, I/O corresponding to the AES/EBV standard or the analogue type. The

10 decoding apparatus must be compatible with the encoder.

The output signal from the decoder 23 will be an analogue signal, which can drive a TV monitor 16/9 or a high definition projecting machine 25.

Some control activities are locally carried out by the
15 single terminals; the control unit 24 of the terminal is formed by a computer adapted for this purpose, with a software suited to perform the following functions:

- to receive the diagnostic data of the whole terminal 4
and to send to the network control center 3 all the
20 anomalies which have been detected;

- to send a report or statement on the quality of the received signal, based on the quality data measured at the output of the demodulator 21 (measure of the BER, bit error rate);

25 - to interpret and to perform the controls sent by the control center;

- to enable the terminal 4 to receive the signal after having interpreted the password.

The control unit 24 performs, via software, some additional functions related to the management of this service, like:

- counting of the number of projections;
- 5 - inhibiting the terminal to reproduce the content of the memories. This function may be put into effect on demand of the control center 3 or when the maximum number of authorized projections has been reached;
- sending the collected data to a processing center.

10 The access to the terminal 4 is authorized each time by the network control center 3 which uses the two transmission media which connect it to the terminal. The access to the terminal for the maintenance is controlled by the control center, always sending a pair of
15 recognition keys. The software access keys are chosen on the basis of reproducibility preventing criteria and safety criteria according to military standards.

The control unit must provide for the access via cable line. The receiving terminal may be upgraded to transmit
20 voice or low speed video signals, originated locally, to

~~a selected number of cinema halls connected to the HDTV~~

distribution network, so to implement the technical background for interactive and multimedia applications.

The projecting machine 25 plays a very important role
25 for the determination of the quality of the image reproduced on the large screen, and for this reason it is selected according to qualitative and technological properties which are directly related to the size of

- 16 -

the screen and the selected cinema. The projecting machine is compatible with the standard 1250/50 and 1125/60.

The role played by the control center 3 is evident; it sends enabling signals which allow a communication between the terminal 4 and the satellite 2 only if the terminal 4 is effectively enabled thereby providing for an additional protection of the bit string transmitted by the satellite.

Industrial Applicability

It is also apparent how the work necessary for the management of a cinema-hall or a multi-room cinema-hall will be minimised and at the same time the movie is more protected.

This service may be implemented in Italy using a national spatial segment ITALSAT belonging to Telecom Italia until now employed for experimental work. The frequency band of ITALSAT coincides with the frequency band assigned in Europe by IFRB for HDTV distribution service via satellite.

Particularly the cinema-halls of the suburbs will draw advantage from this service, since, due to the fact that long waiting periods for the film distribution caused by a limited number of copies to be necessarily initially shown in a first view cinema hall are eliminated, the cinema-halls of suburbs will have an occasion to promote first views in the suburbs simultaneously with film-

shows in the halls of great cities.

Also the service related to live picture shooting may have various applications, for instance in relation to soccer-matches on sunday and in particular out matches, which will in this way draw the attention of those fans who cannot follow their team for various reasons; moreover cultural shows like the "première" of an opera or public meetings will give rise to more interest. A last advantage of the present invention to be put in evidence, is that those who will mostly benefit by this remote control cinema service will be the owners of more than one cinema-hall or those who run multi-room halls, since they will profit from a reduction of the management costs and will have increased commercial opportunities.

As a matter of fact, the system itself must be considered as a means to approach the introduction of multimedia and interactive services to the cinema market.

- 18 -

CLAIMS

1. High definition TV motion picture distribution network via satellites, characterized in that it comprises:

5 I) a service center for the management and commercial / administrative planning of the film distribution in the various cinema-halls;

II) a network control center (3) which performs the following operations:

10 - transmitting the filed movies assigned by the service center, to the addressees or users, according to the planning of the service center;

15 - enabling of the receiver terminals of the users (4', 4'', ... 4ⁿ) by means of the network software, which checks the situation of the terminal; wherein the control center puts into effect all the access and diagnostic functions through via cable lines (6);

- check of the quality of the transmission via satellites by monitoring both the transmission terminal and the receiver terminals;

20 - promoting the maintenance of the receiver terminals (4', 4'', ... 4ⁿ) in the event of malfunctions;

- determining the modalities how the data are to be transmitted again to those receiver terminals which showed to have anomalies in recording and in the
25 quality of the received signal;

- coordination of the transportable units (1) for the transmission of the live picture shooting, enabling the user terminals ($4', 4'' \dots 4^n$) to receive the signal;
 - III) a plurality of receiver terminals ($4', 4'', \dots 4^n$),
5 each of them comprising:
 - a receiver (20) via satellite, a demodulator (21), a digital recording apparatus (22), a decoder (23) and an apparatus (25) for the projection of the movie on a large screen according to different high definition
10 standards, wherein these constituent blocks or components (20, 21, 22, 23, 24, and 25) are interfaced with a control unit (24) performing the telemetering and detection functions on the blocks (20, 21, 22, 23, 24 and 25) comprised in the receiver terminal; wherein the control
15 unit (24) stores and processes again the information related to the operation of the terminal, said control unit being directly linked by dedicated communication protocols and through via cable telephone lines (6) to the network control center (3);
 - 20 IV) transportable units (1) for the live pictures shooting and transmission, which are directly linked to the satellite (2) during transmission and monitored by the control center of the network (3).
- 25 2. High definition TV motion picture distribution network via satellites, according to claim 1, characterized in that the monitoring of the receiver terminal is performed already at a centralised level,

providing a demodulator (11) , a decoder (12) and a HDTV monitor (13) for image reproduction, and providing further a monitor (15) for a general control on the network which is interfaced with the telephone lines (6).

5

3. High definition TV motion picture distribution network via satellite according to claim 1, characterized in that the quality control of the transmitted signal is performed by means of wideband transmission protocols for the communication between the
10 satellite (2) and the receiver terminals ($4', 4'', \dots 4^n$), wherein the signal is decomposed into packets having a predetermined length and each packet is numbered, so as to be easily identified and substituted in case it
15 does not correspond to quality standards.

4. High definition TV motion picture distribution network via satellite according to claim 1, characterized in that in order to realize the
20 communication and monitoring with the receiver terminals ($4', 4'', \dots 4^n$) having predetermined addresses, communication protocols with the following functions are used:

- polling, that is interrogation of the selected
25 terminals;
- narrowcasting, that is data distribution to a limited and selected number of terminals;
- broadcasting, that is data distribution to all

terminals.

5. High definition TV motion picture distribution network via satellite according to claim 1, characterized in that the output signal from the demodulator (21) may be directly sent to the decoder (23) or may be stored in a device (22) designed for this purpose, suited to receive a digital flow with a predetermined rate, wherein the recording device (22) transforms the electric signal with standard characteristics into a digital flow suited to be buffered and wherein the memory of the recording device (22) is embodied by a physical medium which is not removable, like a hard disk.

15

6. High definition TV motion picture distribution network via satellite according to claims 1 and 5, characterized in that each time the movie stored in the hard disk is projected, a recognition or identification number of the terminal is randomly introduced, and wherein this number is not visible during the normal reproduction but only in slow-motion, thereby determining in an univocal way the relation between the receiver terminal and the "copy" of the film possibly reproduced by an action of piracy from this terminal, and wherein this number is randomly and differently inserted for each projection in a plurality of pixels coded with a frequency below eighteen

images / second.

7. High definition TV motion picture distribution network via satellite according to claims 1 and 5, characterized in that it is protected from non-authorized external tampering by means of a self-destruction technique of the memories content, wherein the memory erasure function is performed by a microswitch, anti-intrusion sensors or other electromechanical devices.
8. High definition TV motion picture distribution network via satellite according to the preceding claims, characterized in that local control operations are performed by each terminal (4', 4'', ... 4[~]) by means of the control unit (24) which allows to:
- collect the diagnostic data of the whole terminal (4) and to send to the network control center (3) the anomalies which have been found;
 - to send a report or statement on the quality of the received signal, based on the quality data measured at the output of the demodulator (21);
 - to interpret and put into effect the control signals sent by the control center;
 - to enable the terminal (4) to receive the signal after the key or password has been interpreted.

9. High definition TV motion picture distribution

network via satellite according to the preceding claims, characterized in that additional operations of local control are performed by each terminal (4', 4'', ... 4ⁿ) by means of the control unit (24), which can:

- 5 - perform the counting of the number of film-shows;
- inhibit the terminal from reproducing the content of the memories, on demand of the control center (3) or when the maximum number of authorized projections has been reached;
- 10 - to send the collected data to a processing center.

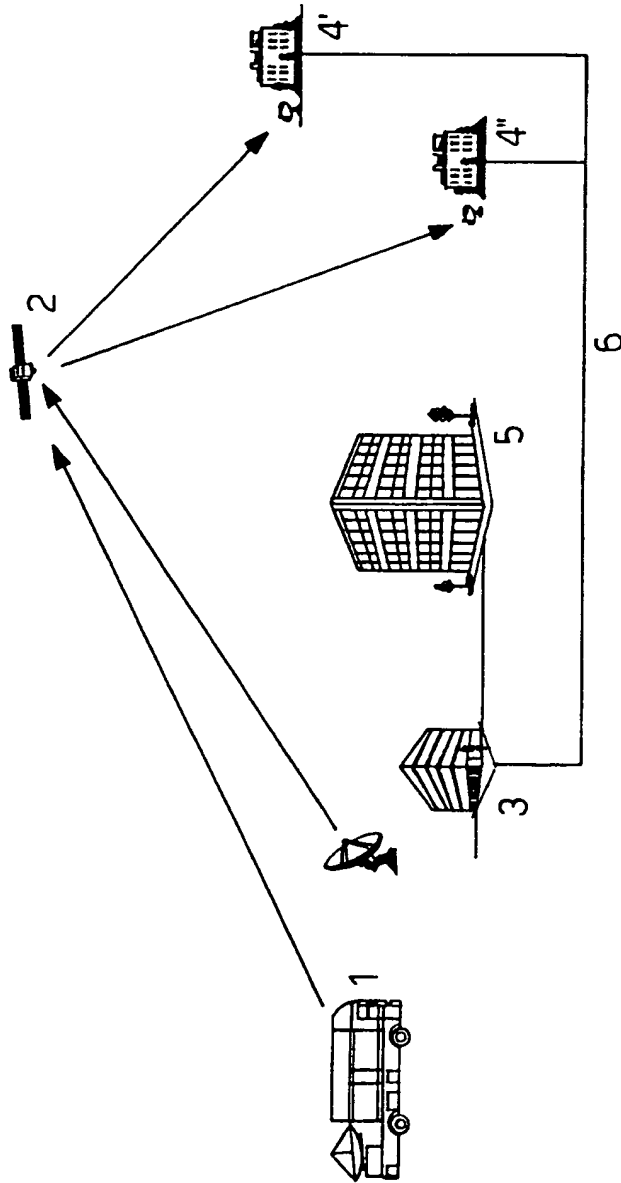


FIG. 1

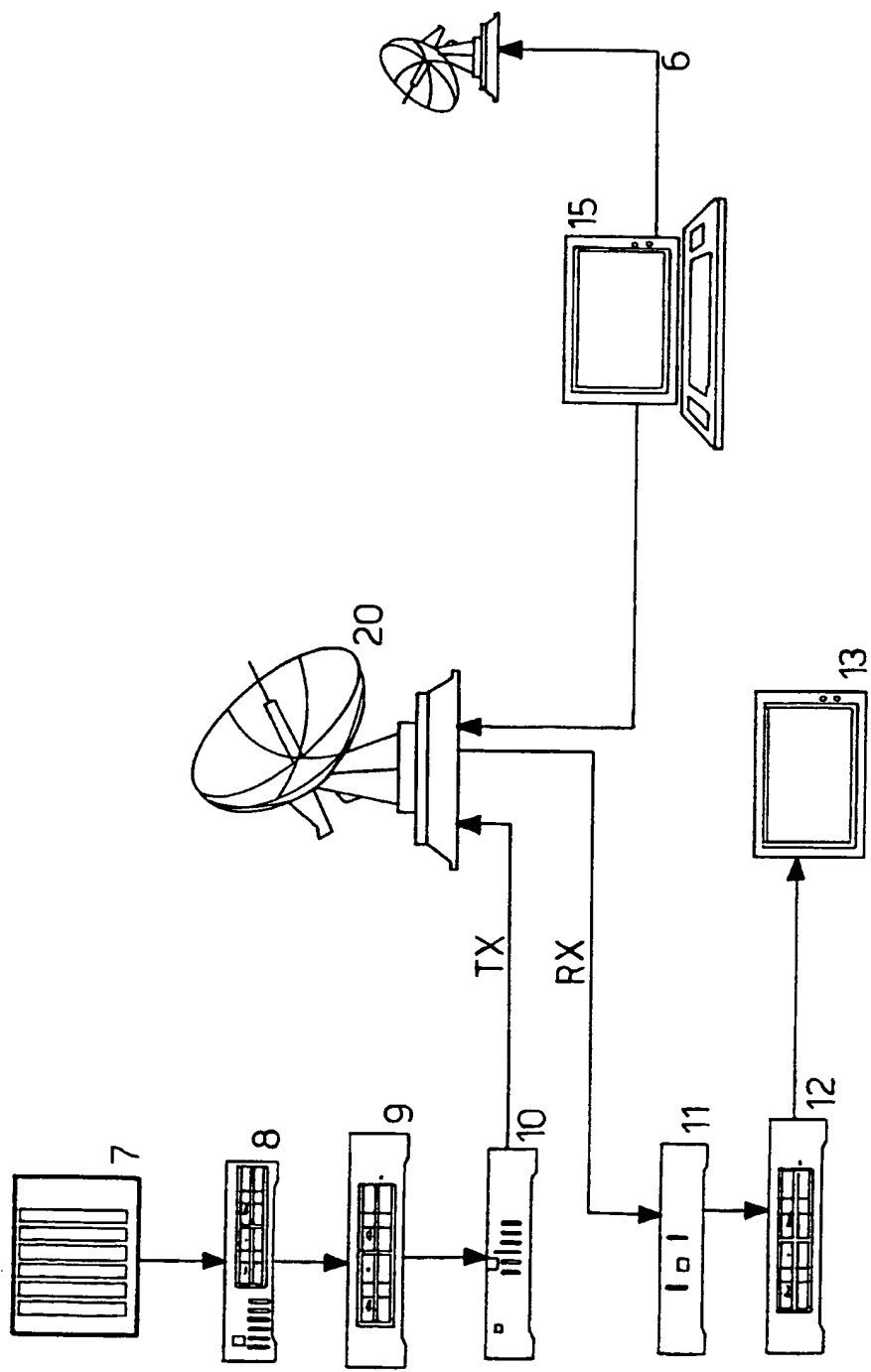


FIG. 2

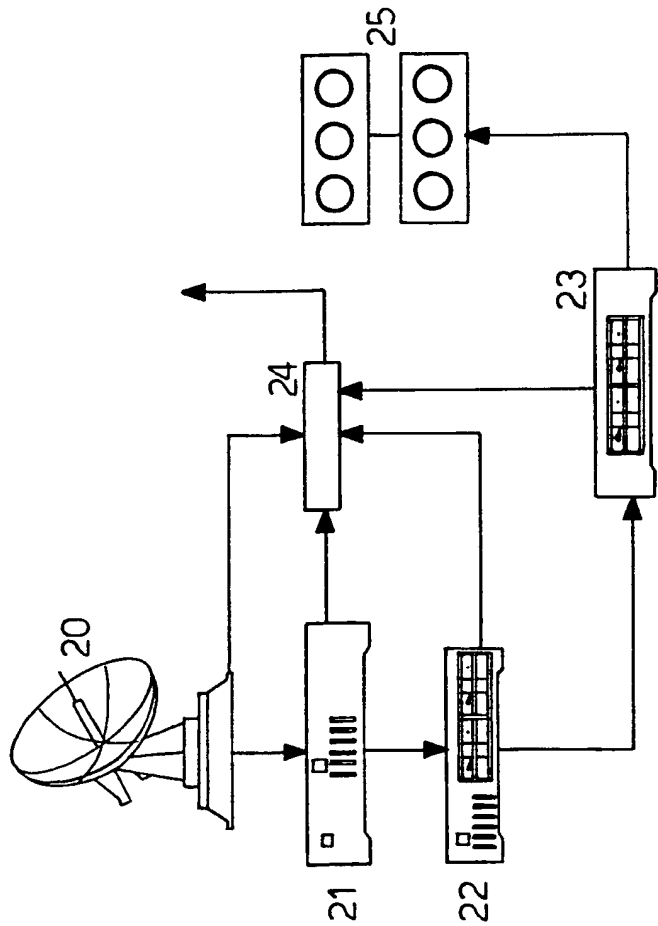


FIG. 3

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 96/00155

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04N7/16 H04N7/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| A | EP,A,0 277 451 (VIDEOSTONE ELECTRONIQUE SARL ;ROUART ANDREE (FR); DOMAGALA PETER () 10 August 1988 see page 2, column 1, line 33 - column 2, line 39 see page 3, column 4, line 9 - line 48 see figures 1,2 --- | 1,5-7 |
| A | NTT REVIEW, vol. 5, no. 3, 1 May 1993, TOKYO, JP, pages 58-61, XP000368127 KOJI NAKAMURA ET AL: "HDTV TRANSMISSION SERVICE NOW AVAILABLE IN THE SATELLITE VIDEO COMMUNICATION SERVICE" see the whole document --- -/-- | 1,5-7 |

☒ Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search

31 October 1996

Date of mailing of the international search report

29.11.96

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|------------|--|-----------------------|
| A | <p>EP,A,0 506 435 (SCIENTIFIC ATLANTA) 30 September 1992 see page 2, line 5 - line 16 see page 14, line 55 - page 16, line 45 see figures 12,13</p> <p>---</p> | 1-4,8,9 |
| A | <p>US,A,5 291 554 (MORALES FERNANDO) 1 March 1994 see column 2, line 51 - column 3, line 23 see column 4, line 56 - column 5, line 50 see column 6, line 1 - column 7, line 62 see figures 1-5</p> <p>---</p> | 1,4-9 |
| A | <p>IEEE TRANSACTIONS ON CONSUMER ELECTRONICS, vol. 38, no. 3, 1 August 1992, NEW YORK, NY, US, pages 296-299, XP000311857 KENJI NAKASHIMA ET AL: "HDTV BROADCAST, FROM STUDIO TO HOME" see page 296, left-hand column, line 14 - right-hand column, line 18 see page 297, right-hand column, line 16 - line 39 see page 298, left-hand column, line 30 - page R, column 19</p> <p>-----</p> | 1,5-7 |

INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/IT 96/00155

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| EP-A-0277451 | 10-08-88 | FR-A- 2609589 | 15-07-88 |
| ----- | | | |
| EP-A-0506435 | 30-09-92 | US-A- 5237610 | 17-08-93 |
| | | AU-B- 650958 | 07-07-94 |
| | | AU-A- 1384092 | 01-10-92 |
| | | CN-A,B 1066950 | 09-12-92 |
| | | EP-A- 0679029 | 25-10-95 |
| | | EP-A- 0683614 | 22-11-95 |
| | | JP-A- 5145923 | 11-06-93 |
| ----- | | | |
| US-A-5291554 | 01-03-94 | NONE | |
| ----- | | | |

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